



# tech briefs

Westinghouse Savannah River Company

## Increases safety, reduces maintenance

### CentriDuti™ Centrifuge Unbalance Detection System

#### at a glance

Detects small imbalances in large payloads

Automatically shuts down unbalanced centrifuges

Enables real-time condition monitoring

Protects personnel

Extends equipment life

Can be easily retrofitted

Patent No. 6,350,224

#### for more information

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CentriDuti™ is a trademark  
of Westinghouse Savannah River Company.

Engineers at Westinghouse Savannah River Company (WSRC) have developed an improved control system for detecting imbalances in centrifuges carrying large payloads. The CentriDuti system can be incorporated in new equipment or easily retrofitted in existing equipment.

#### Background

The rotational operations of centrifuges must be precisely controlled. The high rotational speeds of centrifuge motors create large amounts of kinetic energy. Uncontrolled release of this energy can result in centrifuge damage or even destruction. This can cause injury to personnel and obviously shortens the operating life of the equipment.

Existing unbalance detection systems are not adequate for controlling large-scale centrifuges – those carrying payloads in the 100 to 200 lb range which operate at low frequencies (up to 760 rpms). Payloads in these centrifuges are subject to forces in excess of 300 g's. With such large payloads, an imbalance at low frequencies (less than 100 rpm) can create a safety hazard. The slightest imbalance can cause catastrophic failure.

Also, certain types of testing require instant centrifugal ramp-ups and ramp-downs. These create unusual stresses and can cause vibration resembling an imbalance.

#### What does it do?

The CentriDuti invention can distinguish true load imbalances from normal vibrations for speeds in the 0 to 760 rpm range, including those during linear or non-linear ramp-ups and ramp-downs at low rpms. The system can detect imbalances of as small as 5 lbs in a 200 lb payload. The system also automatically displays a relative imbalance value so the operator can see the condition of the centrifuge as it operates. If an imbalance does occur, the system automatically shuts the centrifuge down.

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## CentriDuti™ Centrifuge Unbalance Detection System

### How does it work?

The CentriDuti system comprises a sensor, a processor, custom algorithm-based software, a display, and a shutdown relay. The accelerometer sensor sends a signal through a low-pass filter where extraneous vibrations associated with normal operation of the centrifuge are removed. The filtered signal is passed through an analog/digital converter before being fed into a processor for analysis by the algorithm.

The algorithm interprets both the amplitude and the frequency of the signal. If the amplitude threshold is exceeded, the algorithm counts cycles during a predetermined time period. If a set number of cycles occurs during the threshold time period, the CentriDuti system shuts down the centrifuge by sending a signal to a relay. By using a threshold time period, the system can distinguish between a true imbalance and a rapid rampup.

The processor displays a real-time relative imbalance value so the operator can monitor the condition of the centrifuge at all times during operation.

### Partnering opportunity

The U.S. Patent and Trademark Office has issued Patent No. 6,350,224 on this invention.

WSRC invites interested companies with proven capabilities in this area of expertise to enter into a licensing agreement with WSRC to manufacture and market this device as a commercial product. Interested companies will be requested to submit a business plan setting forth company qualifications, strategies, activities, and milestones for commercializing this invention. Qualifications should include past experience at bringing similar products to market, product design and development capabilities, reasonable schedule for product launch, sufficient manufacturing capacity, established distribution networks, and evidence of sufficient financial resources for product development and launch.

### Technology transfer

WSRC is the managing contractor of the Savannah River Site for the U.S. Department of Energy. WSRC scientists and engineers develop technologies designed to improve environmental quality, support international nonproliferation, dispose of legacy wastes, and provide clean energy sources.

WSRC is responsible for transferring technologies to the private sector so that these technologies may have the collateral benefit of enhancing U.S. economic competitiveness.

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